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MOVEMENT LIMITER, PARTICULARLY FOR PIVOTABLE ELEMENTS OF A VEHICLE SEAT

CROSS-REFERENCE TO RELATED PATENT APPLICATIONS

[0001] This application is the National Stage of International Application No. PCT/EP2003/011533, filed October 17, 2003 and claims benefit to German Application No. 10249100.3, filed October 21, 2002, both of which are incorporated herein by this reference.

BACKGROUND

[0002] The present disclosure relates to a device for limiting the movement of rotatably mounted parts. In particular, the present disclosure relates to a device for limiting the movement of a rotatably mounted backrest of a vehicle seat.

[0003] A device of the generic type is disclosed by the published patent application DE 44 35 835 A1. The rear seat unit for a motor vehicle described therein is equipped with a vertically divided backrest, the backrest segments of which are rotatably mounted in the transition to the seat part and independently of one another can be folded forwards from an upright use position into a horizontal transport position.

[0004] In the event of a frontal impact, cargo situated in the luggage space can strike the rear side of the upright backrest and can expose the backrest to considerable forces. To counter such forces, the backrest segments can be bolted together by means of a bolt horizontally displaceable transversely to the direction of travel in the event of an accident. If cargo strikes one backrest segment, not only is the rotational movement of the latter limited by lateral locking on the body side, but the forces are also dissipated to the body-side locking of the other backrest segment by way of the bolt. Limiting the movement of the backrest may improve the safety of the vehicle occupants.

[0005] The bolt is displaced by means of a spring energy accumulator or a pyrotechnic charge, which is activated by a deceleration sensor responding to a high rate of vehicle deceleration.

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[0006] Such systems are technically expensive and in addition may harbor certain dangers for the vehicle occupants due to the high bolt speeds.

[0007] Thus there is a need to provide a movement-limiting device which is reversible and which affords a conspicuously simple design construction.

SUMMARY

[0008] One exemplary embodiment relates to a device for limiting the movement of a first vehicle seat. The first vehicle seat has a first upholstery element and a second upholstery element. The first upholstery element is rotatably mounted to the second upholstery element about a hinge. The device comprises a latch configured to be arranged within the first upholstery element. The latch comprises a bolt moveable between an operative position and a retracted position. The bolt is configured to extend out of the first upholstery element in the operative position and to retract into the first upholstery element in the retracted position. The device also comprises a counterpart configured to be mounted near the first vehicle seat. The counterpart is engageable with the bolt in a releasably lockable manner. The device further comprises a control device configured to be arranged in an area of the hinge. The control device is operatively coupled to the bolt by a force transmitting device.

[0009] Another exemplary embodiment relates to a vehicle seat. The vehicle seat comprises a first upholstery element rotatably mounted relative to a second upholstery element at a hinge and a device for limiting the movement of the first upholstery element. The device comprises a latch arranged within the first upholstery element. The latch comprises a bolt moveable between an operative position and a retracted position. The bolt extends out of the first upholstery element in the operative position. The device also comprises a counterpart configured to be mounted near the vehicle seat. The counterpart is engageable with the bolt in a releasably lockable manner. The device further comprises a control device arranged in an area of the hinge. The control device is operatively coupled to the bolt by a force transmitting device.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The drawings represent various exemplary embodiments of a vehicle seat and a device for limiting movement of a rotatably mounted part in schematic form.

[0011] Fig. 1 shows a side view of a first vehicle seat equipped with an exemplary embodiment of a device for limiting movement in a position of use.

[0012] Figs. 2 shows the vehicle seat according to Fig. 1 in a transport position

[0013] Fig. 3 shows an enlargement of the locking piece used in the vehicle seat according to Fig. 1 and 2 in an extended position.

[0014] Fig. 4 shows the locking piece according to Fig. 3 in a retracted condition.

[0015] Fig. 5 shows a control device, suitable for use in the arrangement, in two operative positions.

[0016] Fig. 6 shows an exemplary embodiment of a vehicle seat equipped in a position of use including an exemplary embodiment of a device for limiting movement.

[0017] Fig. 7 shows the vehicle seat according to Fig. 6 in a transport position.

[0018] Fig. 8 shows a front view of an exemplary embodiment of a bench seat with divided backrest and a locking of the backrest segments including a device for limiting movement.

[0019] Fig. 9 shows an enlarged section X-X from Fig. 8.

[0020] Fig. 10 shows a control device for the bench seat according to Fig. 8.

[0021] Fig. 11 shows another exemplary embodiment of a vehicle seat equipped including an exemplary embodiment of a device for limiting movement in a position of use.

[0022] Fig. 12 shows the vehicle seat according to Fig. 11 in a transport position.

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DETAILED DESCRIPTION

[0023] Referring generally to the FIGURES, a device for limiting the movement of a rotatably mounted part (e.g., an upholstery part, a backrest, a seat part, etc.) of a vehicle seat is shown according to various exemplary embodiments. The device generally includes a locking piece that operatively interacts with a control device situated in the area of a hinge or joint of the rotatably mounted part. According to an exemplary embodiment, the operative interaction between the locking piece and the control device is achieved by means of a mechanical transmission of force, such as a force transmitted by a Bowden cable. According to various alternative embodiments, it is also feasible to use a connecting rod linkage or a hydraulic device for this purpose.

[0024] According to the embodiments illustrated, the locking piece comprises a bolt arranged so that it is longitudinally displaceable in the rotatably mounted part. The bolt is extendable from one of the end faces of the rotatably mounted part and may be fully retracted into the rotatably mounted part when not in use. Allowing the bolt to be fully retracted into the rotatably mounted part when not in use improves not only the visual appearance of the locking device but may also improve the occupant safety.

[0025] When in an extended or operative position, the bolt is configured to releasably engage a corresponding structure, referred to herein as a counter-bearing or support member, that is mounted at another vehicle seat. According to an exemplary embodiment, the counter-bearing or support member includes an inclined and/or arched end face to facilitate bringing the bolt automatically into engagement with the counter-bearing or support member. According to such an embodiment, the bolt, even in the operative position, can be pushed into the rotatably mounted part against the action of a spring so that the bolt recoils as the bolt strikes the counter-bearing or support member, but then engages in an undercut section of the counter-bearing or support member.

[0026] According to an exemplary embodiment, the device for limiting movement includes a control device that has a mechanical guide about which the

rotatably mounted part is angularly adjustable. The mechanical guide, for example, may comprise a control cam, a guide way or an eccentric disc.

[0027] According to an exemplary embodiment, the counter-bearing or support member acts as limit stop in one direction of rotation of the rotatably mounted part, and as releasable catch device in the opposite direction of rotation of the rotatably mounted part. Thus, for example, an upholstery part of a vehicle seat (e.g., a backrest, a seat part, etc.) can be pivoted into a limit position in which the upholstery part is safeguarded against forcible overturning. Overturning might occur, for example, under the effect of loading in the event of an accident or it might be caused by misuse. On the other hand, the upholstery part can easily be pivoted back from the limit position as soon as a predefined release force is exceeded.

[0028] According to an exemplary embodiment, the limiting device may be used in the context of a vehicle seat having at least one rotatably mounted backrest to limit the movement of the backrest a from a substantially upright position onto the seat part. According to another exemplary embodiment, the limiting device may be used in the context of a vehicle seat having a seat part that can be folded from a substantially horizontal use position away from the backrest into a vertical or horizontal transport position. According to a further exemplary embodiment, the limiting device may be used to limit the movement between segments of the backrest that can be folded from substantially upright use positions onto the seat part into horizontal transport positions.

[0029] Referring to Figs. 1 and 2, a vehicle seat 1 is shown according to an exemplary embodiment. The vehicle seat 1 comprises a seat part 3 connected to the vehicle floor 2 and a backrest 5 rotatably connected to the seat part 3 in the area of a hinge or joint 4. The backrest 5 can be folded from a substantially upright use position (shown in Fig. 1) in the direction of another vehicle seat 6 arranged in front of the vehicle seat 1 into a horizontal transport position (shown in Fig. 2).

[0030] The vehicle seat 1 further comprises a movement limiting device in an area of the backrest 5 remote from the hinge or joint 4. According to the embodiment illustrated, the movement limiting device comprises a locking piece 7 provided with a bolt 9 that can be pushed out of the upper end face 8 of the backrest 5.

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The vehicle seat 1 further comprises a control device 10 operatively connected to the movement limiting device. According the embodiment illustrated, the control device 10 comprises a control cam 11 and a feeler 12 arranged in the area of the hinge or joint 4. The feeler 12 and the bolt 9 operatively interact by way of a mechanical force-transmitting device 13, shown as a Bowden cable 14, in such a way that the feeler 12, which is pressed in by the control cam 11 when the backrest 5 is folded forwards, pushes the bolt 9, connected to the other end of the Bowden cable 14, forward above the end face 8.

[0031] Referring to Fig. 2 in particular, the bolt 9 is configured to be releasably latched in a counter-bearing or support member 15 situated on the rear of another vehicle seat 6. According to an exemplary embodiment, the function of the counter-bearing or support member 15 is two-fold. First, the counter-bearing or support member 15 presents a predefined resistance necessary to the return the backrest 5 from the horizontal transport position to the substantially upright use position. Second, the counter-bearing or support member 15 prevents any forcible overturning of the backrest 5 due to overloading of the rear side 16.

[0032] Referring Figs. 3 and 4, the locking piece 7 is shown according to an exemplary embodiment. The locking piece 7 comprises the bolt 9 which, when the backrest 5 is folded forwards (shown as arrow A) into the transport position, is pushed out of the backrest 5 (shown as arrow B) by the Bowden cable 14 assisted by a compression spring 17 and then protrudes from the end face 8 of the backrest 5. The bolt 9 is naturally withdrawn against the resistance of the compression spring 17. As the bolt 9 engages the counter-bearing or support member 15, the bolt 9, rounded with a domed shape at its projecting end, overcomes a first projection 19 integrally formed on the counter-bearing or support member 15, which is relatively short and which is passed over as the bolt 9 recoils when the backrest 5 is folded in the direction of the arrow A. Once the bolt 9 passes the first projection 19, the bolt 9 springs back into its projecting position and is positioned in a recess 20 on a further, more salient projection 21 of the counter-bearing or support member 15, which can no longer be overcome, even under high load, and which serves as limit stop for the rotational movement of the backrest 5.

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[0033] During the brief compression of the bolt 9 as it passes the first projection 19, the bolt 9 can be displaced without affecting the control device 10. Referring to Fig. 3 in particular, the bolt 9 defines a cavity 22 configured to receive the end piece 23 of the Bowden cable 14. The cavity 22 allows the bolt 9 to be displaced relative to the end piece 23 of the Bowden cable 14 so that there is no reaction on the control device 10 as the bolt 9 passes the first projection 19.

[0034] Referring to Fig. 4 in particular, when the backrest 5 is folded back into the use position (in the direction of arrow C), the bolt 9 is first disengaged from the recess 20 under renewed compression and is then retracted into the backrest 5 (in the direction of arrow D) until the domed end of the bolt 9 is aligned approximately flush with the end face 8 of the backrest 5. In this position, the bolt 9 is largely invisible and does not adversely affect the handing of the vehicle seat 1.

[0035] As stated above, the locking piece 7 is mechanically connected by way of the Bowden cable 14 to the control device 10. Referring to Fig. 5, the control device 10 comprises a control cam 11 fixed to the seat part 3 and a feeler 12 pivoting with the backrest 5. The feeler 12 has a pin 24, which is pressed onto the contour of the control cam 11 by means of a compression spring 25. The compression spring 25 has a greater stiffness than the compression spring 17 acting in the locking piece 7, which is essentially intended to permit releasable engagement of the bolt 9 in the counter-bearing 15. The pin 24 is pushed into the backrest 5 as the pin 24 runs over the contour of the control cam 11 as the backrest 5 is folded forward in the direction of arrow A thereby pushing the bolt 9 is pushed out via the Bowden cable 14. Reciprocally, the pin 24 is forced back out of the backrest 5 by the compression spring 25 when the bolt 9 is retracted as the backrest 5 is folded rearward in the direction of arrow C.

[0036] Referring to Figs. 6 and 7, a vehicle seat 1 is shown according to another exemplary embodiment. According to the embodiment illustrated, both the backrest 5 and the seat part 3 are folded from a use position (shown in Fig. 6) into a transport position (shown in Fig. 7). For this purpose the seat part 3, on its side remote from the backrest, is rotatably connected by means of a further hinge or joint 26 to the vehicle floor 2, and can be pivoted from a horizontal use position into a

vertical transport position, in which it bears on the other vehicle seat 6 arranged in front of the vehicle seat 1. The backrest 5 of the vehicle seat 1 can then be pivoted forward into a horizontal transport position.

[0037] In order to protect the front vehicle seat 6 from cargo striking it in the event of an accident, a protective plate 27 can be drawn out of the seat part 3 when the seat part 3 is pivoted into the vertical transport position. Forces acting on the protective plate 27 are dissipated via the joint 26 and a locking piece 7 into the vehicle floor 2 and/or the front vehicle seat 6. The locking piece 7 is arranged in the seat part 3 and is configured to be connected to a counter-bearing or support member 15 mounted to the vehicle seat 6. According to an exemplary embodiment, the locking piece 7 is arranged in an area of the seat part 3 facing the backrest 5 and is provided with a bolt 9 which can be extended out of the relevant end face 8 and which also engages in the counter-bearing or support member 15 as soon as the seat part 3 is situated in the vertical transport position.

[0038] The locking piece 7 and counter-bearing or support member 15 illustrated in Figs. 6 and 7, correspond in function and construction to the embodiments of the locking piece 7 and counter-bearing or support member 15 previously described with reference to Figs. 1 through 5.

[0039] Referring to Figs. 8 and 9, a vehicle seat is shown according to another exemplary embodiment. According to the embodiment illustrated, the vehicle seat is shown as a vehicle bench seat 28 equipped with an exemplary embodiment of a movement limiting device and having a divided backrest 5. The backrest 5 is divided into backrest segments 29.1, 29.2, which can each be pivoted forward independent of one another onto the seat part 3 by means of hinges or joints 4.1 to 4.3.

[0040] In order to dissipate overloads, which in the event of an accident may act upon the rear side of a backrest segment 29.1, 29.2, through the entire backrest 5, the segments 29.1 and 29.2 in their upright use positions can be interconnected by way of two locking pieces 7.1, 7.2. One of the locking pieces 7.1, 7.2 is arranged in each backrest segment 29.1 and 29.2 and are configured to engage a counter-bearing or a support member 15.2, 15.1 arranged in the other backrest segment 29.2, 29.1. In a departure from the embodiments previously described, bolts 9.1, 9.2 of the locking

pieces 7.1, 7.2 are actuated so that they extend out when the backrest 5 is in the use position and are retracted into the backrest 5 when folding one of the backrest segments 29.2, 29.1 over into the transport position so as to not impede a passenger sitting next to the folded backrest segment 29.

[0041] At the occurrence of a force F (shown in Fig. 9) acting on the backrest segment 29.1, the backrest segment 29.1 is supported by way of the longer projection 21.1 acting on the bolt 9.2 of the other backrest segment 29.2. Should the force act on the other backrest segment 29.2, the force is transmitted by way of the laterally inverted locking piece 7.1. Both backrest segments 29.1, 29.2 are in turn connected by way of lateral arresting mechanisms 30.1, 30.2 to the vehicle body. The movement limiting device therefore serves to distribute any force acting off-center to both of the arresting mechanisms 30.1 and 30.2.

[0042] The locking pieces 7.1, 7.2 are actuated by way of two control devices 10.1, 10.2 arranged in the area of the middle hinge or joint 4.2 and connected to Bowden cables 14.1 and 14.2.

[0043] In order to be able to fold the backrest segment 29.1 forward separate of backrest segment 29.2, the projection 21.1 designed to rotate in the counter bearing or support member 15.1 must be temporarily pivoted backwards by means of an actuating device (not shown). The other backrest segment 29.2 is similarly released by an actuation of the counter-bearing or support member 15.2. The articulated support for the projections 21.1 and 21.2 is provided with a releasable locking mechanism which is capable of withstanding the loads in the event of an accident.

[0044] As shown in Fig. 10, a control device 10 is shown according to another exemplary embodiment. The control device 10 illustrated in Fig. 10 is in principle similar in design and construction to the embodiments previously represented. However, according to the embodiment illustrated in Fig. 10, the control cam 11 is designed so that the pin 24 is pushed in when the backrest 5 is in the upright position thereby extending the bolt 9 out of the backrest.

[0045] Referring to Figs. 11 and 12, a vehicle seat is shown according to another exemplary embodiment. The vehicle seat illustrated in Figs. 11 and 12 largely corresponds to the embodiment according to Fig. 6 and 7, but in contrast to

this the seat part 3 in the hinge or joint 26 can be folded approximately 180 degrees forward into a horizontal transport position, thereby increasing the load floor considerably.